Claims

[1] A manufacturing method of a semiconductor device comprising the steps of:

(a) preparing a first raw material gas which contains a silane-based compound gas containing carbon atoms with the first concentration of 0.3% or more in a first hydrogen gas;

(b) producing a first diluted raw material gas containing the silane-based compound gas with the second concentration lower than the first concentration by diluting the first raw material gas with a second hydrogen gas;

(c) supplying at least a first portion of the first diluted raw material gas into the inside of a reaction chamber in which a wafer to be processed is accommodated; and

(d) forming a SiGe:C epitaxial layer or a SiGe:C-based epitaxial layer on a first main surface of the wafer to be processed using the first portion of the supplied fist diluted raw material gas.

[2] A manufacturing method of a semiconductor device according to claim 1, wherein a remaining second portion of the first diluted raw material gas is not supplied to the inside of the reaction chamber.

[3] A manufacturing method of a semiconductor device according to claim 1, wherein the first hydrogen gas and the second hydrogen gas have the substantially same concentration

composition.

[4] A manufacturing method of a semiconductor device according to claim 3, wherein the purity of the second hydrogen gas is 99.99% or more.

[5] A manufacturing method of a semiconductor device according to claim 1, wherein the reaction chamber is an epitaxial layer forming reaction chamber of a single wafer epitaxial device.

[6] A manufacturing method of a semiconductor device according to claim 1, wherein the reaction chamber is an epitaxial layer forming reaction chamber of a batch-type epitaxial device.

[7] A manufacturing method of a semiconductor device according to claim 1, wherein the epitaxial layer constitutes a portion of a base region of a HBT.

[8] A manufacturing method of a semiconductor device according to claim 1, wherein the epitaxial layer is a channel region of a strain SiGe-based MISFET.

[9] A manufacturing method of a semiconductor device according to claim 1, wherein the degree of dilution of the first diluted raw material gas is set to a value which falls within a range from 2 to 100.

[10] A manufacturing method of a semiconductor device according to claim 1, wherein the degree of dilution of the first diluted raw material gas is set to a value which falls

within a range from 3 to 50.

[11] A manufacturing method of a semiconductor device according to claim 1, wherein the degree of dilution of the first diluted raw material gas is set to a value which falls within a range from 4 to 20.

[12] A manufacturing method of a semiconductor device according to claim 1, wherein the degree of dilution of the first diluted raw material gas is set to a value which falls within a range from 6 to 15.

[13] A manufacturing method of a semiconductor device according to claim 1, wherein the degree of introduction of the first diluted raw material gas is set to a value which falls within a range from 2 to 100.

[14] A manufacturing method of a semiconductor device according to claim 1, wherein the degree of introduction of the first diluted raw material gas is set to a value which falls within a range from 3 to 50.

[15] A manufacturing method of a semiconductor device according to claim 1, wherein the degree of introduction of the first diluted raw material gas is set to a value which falls within a range from 4 to 20.

[16] A manufacturing method of a semiconductor device according to claim 1, wherein the degree of introduction of the first diluted raw material gas is set to a value which falls within a range from 6 to 15.

[17] A manufacturing method of a semiconductor device according to claim 1, wherein the first concentration is equal to or more than 0.6%.

[18] A manufacturing method of a semiconductor device according to claim 1, wherein the first concentration is equal to or more than 1%.

[19] A manufacturing method of a semiconductor device according to claim 1, wherein the first concentration is equal to or more than 2%.

[20] A manufacturing method of a semiconductor device according to claim 1, wherein the first concentration is equal to or more than 5%.